

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 30.]

JUNE.

[1889.

XCVIII.—JAMAICA COGWOOD.

(*Zizyphus Chloroxylon*, Oliv.)

With Plate.

The cogwood in Jamaica has long been known as one of the most valuable timber trees in the Island. In the early days of sugar and coffee planting cogwood was everywhere in demand for framing for mills and for cog-wheels. It was also known as being very durable in water. It was a tough, hard, and ponderous wood, and sought to be used on all occasions where strength and durability were required. It is probable, owing to the valuable character of the wood, that trees of large size became comparatively scarce, and at the present time such trees are only to be found in remote districts beyond the reach of roads and railways. Our interest at present is not so much connected with the value of cogwood as a timber tree but with its botanical determination. Although known for so long a period it is remarkable that until now the flowers and fruit of Jamaica cogwood had not been received in this

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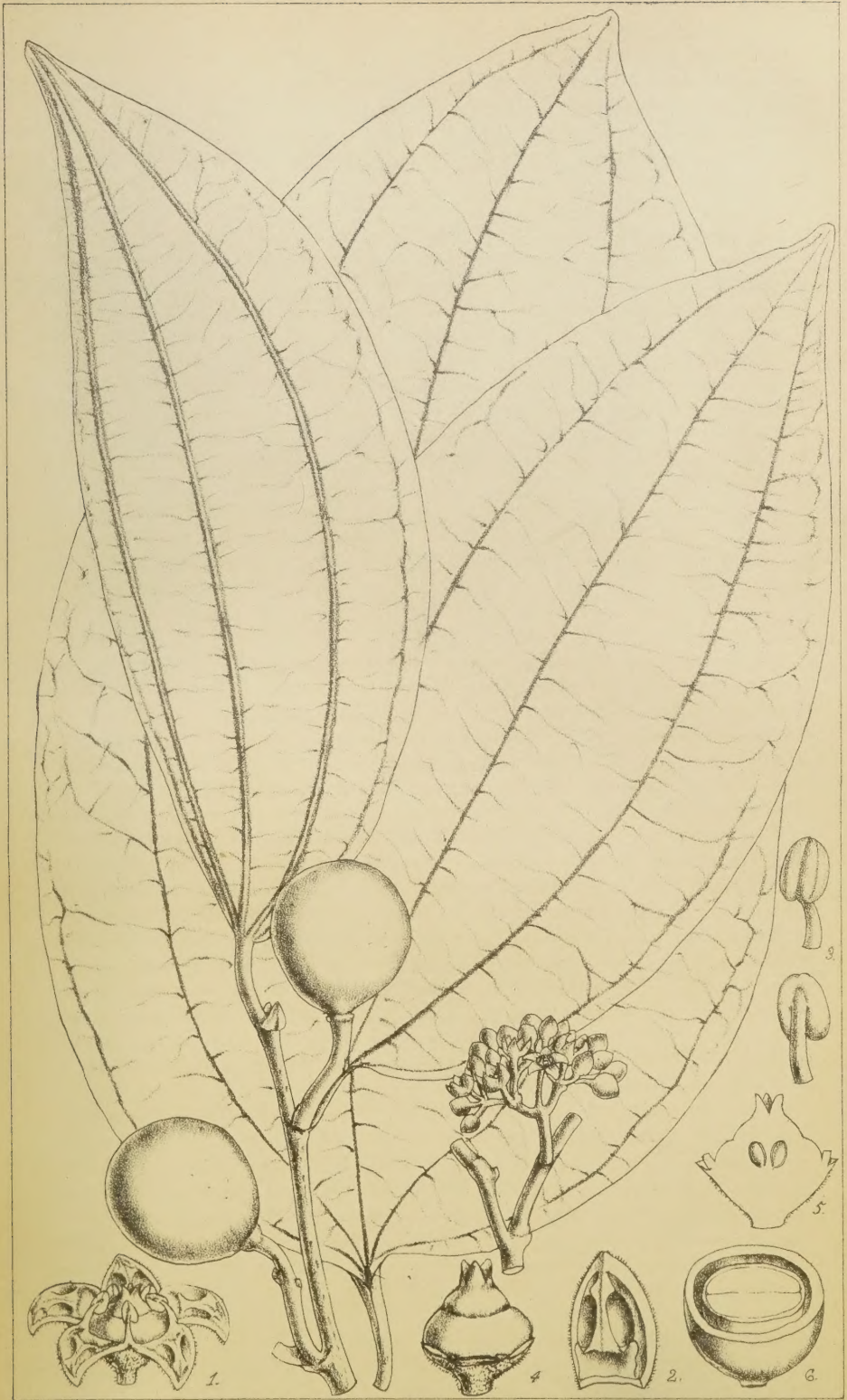
country, consequently the position of the plant in botanical classification had been left in doubt. It is true that Sloane (1696-1725) both mentions the plant and figures it (vol. ii., p. 85, t. 197, fig. 1). Patrick Browne (1756) refers to it as cogwood or green heart. He calls it *Laurus Chloroxylon*, L., and gives a tolerably good figure of the leaves and fruit (p. 187, t. 7, fig. 1). He adds, "It is common in many parts of the mountains, and rises by a strong branched trunk to a very considerable height. The inward bark is of a light blood colour, and incloses a strong greenish timber within the sap. The leaves are smooth, of an oval form, and adorned with three considerable arched veins each; they resemble those of the camphire tree both in shape, size, and texture. This tree bears its fruit, which seldom exceeds a hazel nut in size, scattered up and down upon the branches. The wood is very tough, hard (and ponderous), and observed to answer better than any other sort for the cogs used in rollers of sugar mills, and generally esteemed one of the best timber woods of the Island, and used on all occasions where strength and durability are required."

At the time of the compilation of the *Flora of the British West India Islands* by Dr. Grisebach in 1864 this plant was known not to be a *Laurus*, but its exact position was still undetermined. In a note (l. c., p. 285), Grisebach states, "*Laurus Chloroxylon*, L. (Sl. t. 197, f. 1; Br. Jam. t. 7. f. 1), a valuable timber-tree in Jamaica, from the figures quoted is no *Laurinææ*. Upon Nees's authority it belongs to the *Celestrinææ* (*Ceanothus Chloroxylon*, Ns.), but was omitted in that order as a doubtful plant. My specimens are mere leaf branches, which from their 3-nerved leaves had been compared with *Cinnamomum*, though they are alternate and stipulate."

For the last 10 years efforts have been made by the Botanical Department, Jamaica, to procure good herbarium specimens, embracing flowers and fruit, of cogwood. Owing however to the scarcity of trees of large size, this has been a work of considerable difficulty. At last good specimens have been received at Kew through Mr. W. Fawcett, F.L.S., Director of Public Gardens and Plantations, Jamaica, who writes as follows: "I am at last sending you full material of cogwood. I am sorry that I have not been able to get it before, but I have had several people all over the country looking out for it, and have only now obtained satisfactory material, which I at once despatch. I am indebted to Dr. Dewar and Mr. George Douet for these specimens. I suppose the reason why it has been so difficult to get specimens is that the flowers are minute, and the fruit small and green. It is probable also that only high trees flower."

From the material received from Mr. Fawcett, Professor Oliver has determined the cogwood to be a species of *Zizyphus*, a genus not previously recorded from Jamaica. *Zizyphus* is the Jujube or Lotus genus of *Rhamnææ*, and the fruits of several species, such as *Z. vulgaris* and *Z. Jujuba*, have an agreeable flavour, and are commonly eaten. A description of cogwood with a plate has been prepared for the *Icones Plantarum*, and by the courtesy of the Bentham Trustees a reproduction of the latter is included here with the description:—

Zizyphus Chloroxylon, Oliver (in Hook. Ic. Plant. Pl. 1862, *ined.*). An unarmed tree, with wide-spreading branches. Leaves alternate, ovate or ovate-elliptical, pointed, triple-nerved, the nerves extending to the apex, 4 to 7 inches long, $1\frac{3}{4}$ –4 inches wide, quite entire, smooth, nerves beneath prominent, petioles $\frac{1}{3}$ – $\frac{1}{2}$ inch long.



M.S. de Lett. lith.

Zizyphus Chloroxylon, Oliv.



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Cymes many flowered, corymbose, the peduncle short, pedicels equalling the flowers. Flower-buds rusty-puberulous. Calyx lobes five, spreading, ovate-deltoid, bifoveolate, fleshy, conspicuously keeled on the inner face. Petals none. Filaments as long as the anther. Style three lobed at the top. Fruit subglobose, smooth, one seeded, 8 to 10 lines in diameter. Pericarp crustaceous. Seeds roundish, cotyledons plano-convex. Radicle inferior.—*Ceanothus Chloroxylon*, Nees Syst. Laur. p. 66. *Laurus Chloroxylon*, L. Sp. Pl. Ed. ii., p. 528.—Jamaica in the interior mountains, moderately common.

There is only one small specimen of the Jamaica cogwood in the Kew Museums, and this was obtained from the Paris Exhibition, 1855. It is labelled the “best wood for mill framing and cogwheels, very durable in water.” In this specimen the heart wood is developed only to a small extent, occupying in fact only the central core about 3 inches in diameter out of a total diameter of about 9 inches. To procure serviceable heart wood of the characteristic colour, texture, and weight, it is probable the trees must be allowed to attain considerable age and size. The value of the timber is unquestioned, and in any system for the conservation of forests, and replanting denuded areas that may be adopted in Jamaica, the cogwood will no doubt receive, as it deserves, special consideration. So far as can be gathered this valuable tree is entirely confined to Jamaica.

FIG. 1. Expanded flower. 2. Calyx lobes. 3. Stamens. 4. Ovary (calyx segments removed). 5 Same, vertical section. 6. Transverse section of fruit. Excepting Fig. 6, all enlarged.

XCIX.—COCOA-NUT COIR FROM LAGOS.

As may be gathered from the reports published in the *Kew Bulletin* (1888, p. 149, and 1889, p. 69), Governor Moloney has organised very extensive nurseries in different parts of the Colony of Lagos for the purpose of extending the cultivation of the cocoa-nut palm. Plantations consisting of 30,000 trees have already been established by the Government, whilst seedlings in large quantities are supplied at low rates to private persons with the view of making the industry as general as possible. In this work the recently established Botanic Station is actively engaged, as also the Government organisations attached to the Commissionerships of the Eastern and Western Districts, and of Palma. With the view of utilising to the best advantage the produce of these cocoa-nut plantations, when in full bearing, Governor Moloney has recently prepared experimentally some samples of cocoa-nut fibre so that an opinion might be obtained as to its value in this country. This West African coir was sent to Kew, and very interesting particulars respecting it are contained in the following correspondence:—

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR,

Downing Street, 2nd February 1889.

I AM directed by Lord Knutsford to transmit to you a copy of a despatch which he has received from the Governor of Lagos reporting that he had despatched a bale of [cocoa-nut] coir to Kew.

2. His Lordship will be much obliged if you will kindly furnish him with your opinion on the specimen forwarded.

I am, &c.
(Signed) R. H. MEADE.

The Director, Royal Gardens, Kew.

[Enclosure.]

Governor MOLONEY to LORD KNUTSFORD.

Government House, Lagos,
23rd December 1888.

MY LORD,

At the Colonial Exhibition of 1886 I was given to understand that the natural colour of Lagos coir had, in the opinion of brush and mat manufacturers (I may mention Messrs. Treloar, of Ludgate Hill), a special advantage which should command for it a ready demand and a comparatively high price, if it could be put regularly and in sufficient quantity on the English markets.

2. Accordingly, and in anticipation of the later development of a local manufacture for export of cocoa-nut oil, for which I entertain the opinion that the present annual crop of fruit offers a sufficient encouragement, I have had prepared by prison labour in the gaol of Lagos a bale of coir weighing 42 lbs.

3. This return represents the yield of 400 cocoa-nuts, the average present price of which is at the rate of 2s. 6d. per hundred.

4. The bale has been addressed to the Royal Gardens, Kew, and sent through the Crown Agents for the Colonies.

5. It is now my duty to request that your Lordship will be good enough to invite the co-operation of the Director of the Royal Gardens and obtain an authoritative opinion on the specimen forwarded.

I have, &c.
(Signed) ALFRED MOLONEY.

The Right Hon. Lord Knutsford, G.C.M.G.,
&c. &c. &c.

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

SIR,

Royal Gardens, Kew, 21st February 1889.

I AM desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 2nd instant, forwarding a copy of a despatch from the Governor of Lagos on the subject of a specimen of cocoa-nut coir which he had forwarded to Kew for an opinion as to its merits.

2. The specimen, consisting of a bale weighing 42 pounds, was duly received from the Crown Agents on the 11th ultimo. Samples were prepared and submitted to respectable brokers and dealers in the city, with a request that they would report upon the value of Lagos coir as compared with other coirs now in the London market.

3. The result of the inquiry is contained in the accompanying papers. It would appear in the first place that it is necessary to separate coir fibre, as yielded by the cocoa-nut, into two classes, namely, "bristle" fibre and "mat" fibre. The former is usually sold at about 30l. per ton, and the latter at about 10l. per ton.

4. The sample from Lagos contained these two fibres mixed together, and hence it was not presented in a state suitable for sale in this country. It is evident that Lagos fibre possesses no particular merit on account of its colour, but on the other hand, in Messrs. Harrison and Johnson's Report, it is stated to be "of very good length, which increases its value."

5. Although these reports are not so encouraging as Captain Moloney was led to suppose from the specimens exhibited at the late Colonial and Indian Exhibition, they furnish useful hints as regards the character of coir fibre necessary to command ready sale in this country.

6. With the view of further assisting in this direction, Mr. Thiselton Dyer has caused the specimens of Ceylon "bristle" and Ceylon "mat," forwarded by Messrs. Ide and Christie, to be sent direct to Captain Moloney as samples of coir fibres, which are acceptable to the London buyers. Other samples of fibre are enclosed in the parcel for Captain Moloney, including "brush" fibre, "mat" fibre, and "rough stuffing" fibre, prepared by Messrs. Toye and Bromley from the crude Lagos coir.

I am, &c.

(Signed) D. MORRIS.

The Hon. R. H. Meade, C.B.

[Enclosure No. 1.]

MESSRS. IDE AND CHRISTIE to ROYAL GARDENS, KEW.

SIR, 72, Mark Lane, London, E.C., 7th February 1889.

WE are duly favoured with Mr. Jackson's letter of the 5th inst., and samples of coir from Lagos. These contain soft, half-prepared "bristle" fibre, used in the manufacture of brushes, mixed with short or "mat" fibre. Such a mixture is unfortunate, and detracts from the value of the samples, as the two kinds, being used for different purposes, have to be separated. In the Ceylon coir they are always kept apart, and for your guidance we send you specimens of Ceylon bristle, value 30*l.* per ton, and Ceylon mat, value 10*l.*

There is nothing either in the colour or other character of the Lagos fibre which would justify the expectation of its commanding a ready demand and high price, as the Governor of Lagos has been apparently led to believe. On the contrary, we value the "bristle" portion of your samples at 15*l.*, and the "mat" portion at 9*l.* to 10*l.* per ton.

We are, &c.

(Signed) IDE AND CHRISTIE.

D. Morris, Esq., M.A., F.L.S.

[Enclosure No. 2.]

MESSRS. HARRISON AND JOHNSON to ROYAL GARDENS, KEW.

SIR, 4, Catherine Court, Trinity Square, London, E.C.,
7th February 1889.

WE are in receipt of your favour of the 5th instant, and also the sample. The coir fibre you send is mixed half prepared brush and mat fibre. The former if separated would no doubt find buyers at about 15*l.* per ton, and the mat fibre would sell freely at 9*l.* to 10*l.* per ton.

There is one sample consisting entirely of mat fibre; this is clean and long and would sell well at about 11*l.* to 12*l.* per ton. If the brush fibre were properly combed out like sample we have sent you by post, it would readily fetch 28*l.* to 32*l.* per ton present market value. The samples of fibre you send are of very good length which increases the value.

We would suggest that a small sample shipment be made, you would then get a good idea of the value. It would be no use sending any fibre unless the mat and brush were kept separate.

If in future we can be of any help to you or to the Governor of Lagos in bringing this article before the trade we should be pleased if you would make use of us.

We are, &c.
(Signed) HARRISON AND JOHNSON.

[Enclosure No. 3.]

MESSRS. TRELOAR AND SONS to ROYAL GARDENS, KEW.

68, 69, and 70, Ludgate Hill, E.C.,
9th February 1889.

SIR,

WE are in receipt of your letter of the 5th and of the sample of Lagos coir. In our opinion this is badly cleaned or dressed, and not so good for brush-making as the usual sort. It certainly has no special advantages for mat-making, and is not in our opinion calculated to command a high price here. We have seen better fibre sold at public auction for 22s. per cwt. in London.

We are, &c.
(Signed) TRELOAR AND SONS.

[Enclosure No. 4.]

MESSRS. TOYE AND BROMLEY to ROYAL GARDENS, KEW.

116, Fenchurch Street, London, E.C.,
19th February 1889.

SIR,

WE confirm our letter of the 11th instant and now beg to hand you our report on the fibre samples you sent. We trust this will give you the information desired. Should you require any other point answered we shall be happy to do so.

We are, &c.
(Signed) TOYE AND BROMLEY.

REPORT.

This fibre would find a ready sale here both for brush and mat making purposes, but the two sorts should be kept separate. For brush-making the long fibre can only be used and should be kept straight, and tied in small bundles and then made up in bales weighing about 1 cwt. or 2 cwt. each. The other sort for mat-making should be towelled and packed up into bales. Practically speaking the mat fibre is the combings or short from the brush fibre. There is also in the sample sent us a stuffing of rough fibre in each of the small bundles; this should be avoided as it deteriorates the value considerably; but if this stuffing was separately packed it would also sell here. We consider the value of the three sorts, if made up in the way we have described, would be based on the *present* value of fibre as follows:—

Sample.

No. 1. Brush fibre at 29*l.* to 31*l.* per ton.

No. 2. Mat fibre at 18*l.* to 19*l.* per ton.

No. 3. Rough stuffing sort at 10*l.* to 11*l.* per ton.

We return a sample of each quality to show more clearly our meaning. The brush fibre, we suggest, should be tied up about the size of our sample No. 1. You will notice that we have taken your sample as received, and dressed it into the above three sorts, which your friends will find far more advantageous than sending it in the rough condition.

(Signed) TOYE AND BROMLEY.

C.—A WHEAT PEST IN CYPRUS.

The following preliminary Report upon a species of *Tineina*, an insect destructive to wheat crops in Cyprus, has been communicated for publication in the *Bulletin* by Mr. Arthur E. Shipley, F.L.S., Fellow and Lecturer of Christ College, Cambridge, and Lecturer on Entomology at the Indian Civil Engineering College, Cooper's Hill:—

I am indebted to Dr. Guillemard for the material upon which the following report has been drawn up. It consisted of four specimens of the moth, some of them unfortunately mutilated through an accident; a considerable number of larvæ of various sizes; and five specimens of pupæ, one of them formed in the leaf between the lower and upper epidermis, the others on pieces of coarse linen. There were also several pieces of leaf, containing between the upper and lower laminae numerous roundish bodies which I at first thought might be eggs, but which turned out to be excreta containing fragments of undigested spiral vessels and sometimes chlorophyll grains. The whole of the material was preserved in spirit with the exception of one moth. The moth is known in Cyprus as the *Siriwil*.

Owing to the fragmentary condition of the moths, there was great difficulty in identifying them. Mr. Stainton, the great authority on the *Tineine*, has been good enough to examine the specimens and to inform me that he is disposed to refer the insect to the species *Ecophora temperatella* (Lederer) of which he has specimens from Beyrout and Lydia. This species was also found by the Rev. O. P. Cambridge widely distributed throughout Palestine.

Æ. temperatella has been described by Mr. Stainton in his work on "The *Tineina* of Syria and Asia Minor." The female he informs me by letter is described in the same work as a separate species, *Æ. fusco-fasciata*, though he stated at the time that he was strongly disposed to think that it was the female of *Æ. temperatella*.

I subjoin Mr. Stainton's description of the species.—"Head and face "ochreous at the sides, black in the centre. Palpi long, recurved, "ochreous, the tip of the terminal joint dark grey. Thorax pale or "dark ochreous, concolorous with the anterior wings. Antennæ slender "dark grey somewhat serrated."

"Anterior wings shining ochreous, bright or rather pale and with a very faint greenish tinge; the surface is more or less scattered with grey scales; cilia glossy, pale grey with a faint ochreous tinge."

"Posterior wings lanceolate, very narrow for an *Ecophora*, dark grey, with the cilia a little paler."

"The distance between the tips of the expanded wings is seven or eight lines."

The larvæ are of a yellowish brown colour, and consist of 12 well-marked segments behind the head. The head is encased in a covering of dark brown chitin, and two triangular patches of chitin of the same colour almost cover the dorsal aspect of the first or pro-thoracic segment. The most posterior segment also bears a single plate of chitin in the posterior half of its dorsum.

Each segment has on its dorsal surface a transverse groove dividing it into an anterior and a posterior half. The second and third thoracic segments are provided with more complicated folds. The anterior half of the abdominal segments bears a pair of brown spots dorsally, one each side of the middle line, and on each side are two more dots close together, one rather larger than the other. Below these the skin is rather more whitish than elsewhere and in this whitish patch just above

the insertion of the legs is a conspicuous spot. This spot is only found in the fourth to the eleventh segments inclusive, and is probably the stigma, or opening of the breathing tubes. The posterior half of each segment has two dots, one each side of the middle line immediately behind the dorsal spots of the anterior half of the segment, but the side spots are absent.

On the ventral or under surface each segment has a row of 10 dots almost in the same transverse line, but some of them are absent in the thoracic segments which bear pro-legs.

A pair of true legs is borne on each of the thoracic segments, each limb being surrounded by four chitinous rings and terminating in a claw. The first ring which surrounds the base of the leg is incomplete externally.

The sixth, seventh, eighth, ninth, and twelfth segments bear pro-legs, the first four pairs are completely surrounded by hooks, the posterior and anal pair have hooks wanting on the posterior side.

The larvæ are also provided with long hairs, borne dorsally and laterally.

The oldest larvæ measured 8 mm.

One of the five pupæ which I received was situated between the upper and lower laminæ of a wheat leaf, the other four were on pieces of coarse linen. Each was surrounded by a very scanty web of silk which seemed to attach the last four to the cloth. The pupæ were 4-5 mm. long, of a yellowish colour, but ruddy on the dorsal surface. The wings and legs stand out clearly from the body. At the posterior end of each pupa was an irregular black mass apparently the last larval skin which had been cast off.

The question where the pupa is normally found is most important. Dr. Guillemard is of opinion that it is formed in or on the ground; he says, "When full-grown the caterpillar apparently descends to the ground, only a few making the cocoon on the wheat leaf itself. Owing to my experiments being carried on with barley grown in pots, I cannot say definitely where the cocoons are placed in the natural state, but there should be no difficulty in finding them. What makes me suspect that the larva descends is that my cocoons were all made on the linen bags which were wrapped round the pot; . . . the pupa gives birth to the perfect insect in about a fortnight's time."

In Cyprus the natives have a theory that the *Siriwil* appears only every other year, but it is probable that this is founded upon inaccurate observations. When abundant rain falls in the spring the injury caused by the pest is almost neutralised, but if the rains fail the crops are practically ruined. Captain Young informs me by letter that in the district of Famagusta, which has an area of about 930 square miles, 27,060 donums* were injured. The amount of grain destroyed in this area was estimated at 55,760 bushels of wheat, and 13,940 bushels of barley.

With regard to the habits of the various species of *Æcophora*, the larva of *Æ. minutella* causes damage to nursery men by devouring dried seed, the larvæ of all the other British *Æcophoræ* probably live on decayed wood, so that it is somewhat surprising to find the larvæ of *Æ. temperatella* living on succulent leaves.

A species of Tineina, known as *Ochsenheimeria bisontella* (taurella) attacks wheat in Germany. It seems to have very much the same habits as *Æ. temperatella* the larva burrowing between the two laminæ of the leaves. The eggs of this species are deposited singly by the female on

* An acre is almost equal to two donums.

the wheat leaves. The insect passes the winter in the larval stage. Taschenberg, who describes this pest, states that no remedial measures are known for it.

At present with our imperfect knowledge of the life-history and habits of the *Siriwil*, it is impossible to suggest any means for combating the disease. I would, however, strongly urge upon all those interested in agriculture in Cyprus the importance of determining accurately the following three points :—

- (i.) Where the pupa is normally found, whether in the plant or on or in the ground, &c., and the period which elapses before the moth appears.
- (ii.) Where the eggs are laid, and whether singly or in clumps.
- (iii.) In what stage the *Siriwil* passes the winter.

In conclusion, I wish to express my thanks to Captain Young, Commissioner at Famagusta, and to H. Thompson, Esq., Commissioner at Paphos, for information about the habits of the *Siriwil*; and to H. T. Stainton, Esq., F.R.S., and W. F. Blandford, Esq., for assistance in identifying the species.

CI.—PATCHOULI.

(*Pogostemon Patchouli*, var. *suavis*.)

Patchouli has already been the subject of notice in the *Kew Bulletin* (1888, p. 71 and p. 133). An interesting article on the *Cultivation and Curing of Patchouli and its Adulteration* has lately been contributed to the *Journal* of the Agricultural and Horticultural Society of India by Mr. L. Wray, junior, Curator of the Government Museum, Perak. As the information contained in this article may not be readily accessible in this country and in the Colonies, it has been thought desirable to reproduce it in the *Kew Bulletin* :—

The plant yielding the perfume known as patchouli is usually stated to be indigenous to the Malayan Peninsula, but this seems to be doubtful, as there appears to be no evidence that it has been met with in the jungle, except in places where it could be clearly traced to some old cultivation.

It is grown and much esteemed by the aboriginal tribes of Perak and Pallang, and this should be borne in mind when cases of its being found in out-of-the-way places are brought forward in support of its being a native of the Peninsula. I have met with it at an altitude of nearly 5,000 feet amongst the Sakais of the mountains at the source of the Pallang River, far away from any Malayan villages, also among the same people in the Bernam, Batang Padang, and Kinta Districts of Perak, and among the Semangs in Upper Perak and Selama.

The leaves are made into garlands and worn round the waist by the women, and bunches of them are often stuck into their bamboo ear-rings. I have also seen them mixed with other leaves and flowers and formed into ornamental bunches which are hung up and used in some sort of demon worship or propitiation.

The Sakais of Batang Padang call the plant *Boon kalif*; and, as this is not a corruption or derivation of the Malayan name, it may point to its being known to them prior to their coming in contact with the Malays. The latter people call it *Poko nilam*. The word *nilam* means sapphire, therefore the translation would be sapphire plant.

Patchouli is a very shy flowerer, so much so that by the natives it is said never to flower; and Mr. Hardouin told me that though he had

grown and bought it for the last 30 years, he had never seen or heard of such a thing as a flower or fruit. Mr. N. Cantley, in "Notes on Economic Plants," says: "Plants raised from seed are reported to grow well, but to have no scent, but retain it when produced from cuttings. I have not been able to verify these statements, but it is well known that plants do sometimes play tricks of this kind—sandal-wood frequently." If this report was obtained from native sources it probably only represents another way of saying that the plant hardly ever bears seed.

Many similar sayings exist in regard to other occurrences which are either very rare or do not occur at all. For instance, hidden treasure is said to be found beneath a flowering plant of lemon grass; and the nest of a certain bird (which does not build one) will render the finder of it invisible.

CULTIVATION.

The cultivation of patchouli is carried on almost exclusively by the Chinese in the Straits Settlements. They do not grow it on a large scale, but a man will plant a patch of perhaps half an acre, or an acre at a time.

The land is trenched and thrown up into long beds either 4 feet or 18 inches wide. The former width will take two rows of plants, and the latter only one. The plants are put 2 feet apart along the rows.

The planting should be done in the wet season, and the cuttings, which are about a foot long, require careful shading with leaves until rooted, or they will get withered and die, the plant being a delicate one, and very susceptible to the heat of the sun.

The first cutting of the crop is made in about six months after planting, by which time the patchouli will have reached a height of 2 to 3 feet, and two other cuttings are made from the same plants at intervals of about six months. At the end of this time the old roots are dug up, the land re-trenched and manured and fresh cuttings planted.

I could get no reliable information as to the yield per acre, nor the cost of cultivation, but it must be rather high, as the land has to be thrown up into beds, manured and carefully weeded, and the cuttings shaded, and, in the event of dry weather setting in before they are rooted, they have to be watered until established.

Both flat and hill lands are suitable to its cultivation, and it seems to flourish best under slight shade, but probably the production of oil is less in that grown under shade than in that grown out in the sun, though the yield of leaf would be greater.

I was told by a Chinese merchant, a dealer in patchouli, that it is often planted on new land between coffee, nutmegs, and other permanent crops, and that it pays all the expenses of clearing and planting, leaving the permanent crop as clear profit.

Of natural enemies patchouli seems to have a fair share. One was described to me as a beetle, but as the young leaves which it is said to attack are dwarfed and deformed rather than eaten, I am inclined to think it is a bug. The older leaves are very much attacked by some insects, probably caterpillars and some of the grasshoppers.

CURING AND PRICES.

The plants are cut down near the ground when they have reached a sufficient size, one stalk only being left to each bush. The patchouli is

then laid out in the sun to dry in the daytime, and put under cover at night and on the approach of rain.

The time required to dry it varies with the weather, taking from four days to a week. When thoroughly dry it is done up into bales, and sold either to dealers in the leaves or to the distillers. In this state it fetches about \$8 per pikul of 133½ pounds.

The dealers cut it up and separate a great quantity of the larger stalks, and, according to its freedom from these, it is classed as 1st, 2nd, or 3rd quality. The best consists of leaves only, and is valued at \$30 to \$32 per pikul; but owing to the labour involved, this quality hardly pays to prepare. The second quality is composed of leaves and young shoots with little of the heavier stalk, and ranges in price from \$17 to \$20 per pikul. The third quality contains less leaf and more stalk, and fetches about \$14 per pikul.

The best quality of all would be produced by picking from the plants the leaves and tops of the young shoots, and drying these in the shade, but it is doubtful if it would pay. Prepared in this way 36 lbs. of green leaves produce 10 lbs. of dried patchouli. The per-centage of essential oil in shade-dried leaves is, as might be expected, higher than in those which have been exposed for many hours to the full heat of a tropical sun, which in this latitude often goes over 120° F.

ADULTERATION.

Large quantities of the leaves of a plant known by the Malayan name of *Ruku* are often mixed with patchouli. The botanical name of this plant is *Ocimum Basilicum*, L., var. *pilosum*, Benth.

I was told by Mr. Hardouin (the principal distiller of patchouli oil in the States) that recently a Chinaman bought the whole of the *Ruku* growing wild in a cocoanut plantation in Province Wellesley, and 700 pikuls of the dried herb were collected and taken to Penang, to be used for the adulteration of the more valuable patchouli. Mr. Hardouin says he always prefers to buy the plant just as it is cut, as then it is easy to see if it is adulterated or not, but if the leaves are bought it is very hard to detect the imposition.

The *Ruku* leaves are rather whiter and the stalks smaller and rounder. Seed vessels are often also mixed with them. The smell of the two herbs is quite different, but if the sample has been baled for some time, this would be imperceptible except as communicating a twang to the general odour of the sample.

The leaves of another plant are also often mixed with patchouli. This plant is called *perpulut* by the Malays, and is known botanically as *Urena lobata*. The leaves are when dried much like those of the herb it is used to adulterate, but, unlike it, they are scentless. *Perpulut* is a very common weed all over the Straits Settlements, and is to be had in any quantity for the trouble of collecting it.

MANUFACTURE OF THE OIL.

The dried patchouli is put into a large copper cylinder fitted with a perforated false bottom and mounted on trunnions. Through one of these steam enters from a boiler and is conducted by a tube beneath the false bottom. The remaining trunnion is also hollow, and the steam, after passing through the leaves, passes out by it and into a worm immersed in a tube of water in the ordinary way. The pressure of steam employed is about 10 pounds per square inch, but it varies with the size of the worm and the temperature of the water used to cool it.

One pikul of the dried patchouli, just as it is cut, yields from 24 to 30 ounces of essential oil, and a sample free from the heavier stalks yields about double that amount.

Mr. Hardouin says, that by an ordinary still not more than one-half of the oil can be extracted, the temperature I presume not being high enough to volatilize the whole of it.

He also says that the green leaves yield little or no oil, and therefore it is necessary that they be dried before being subjected to the process of distillation.

The oil is of two distinct varieties, the one being sage green, and the other the colour of medium coloured sherry.

Mr. Hardouin informed me that the green oil is produced from young leaves, and the golden-brown from old leaves, but I am inclined to think that there is a little doubt about this, and that soil and shade have more to do with the colour of the oil than the age of the leaves.

Sometimes the one colour is in greater demand than the other, but the prices are the same for both. At present the price in Penang is about 50 cts. per ounce.

Whether the oil is adulterated or not I have been unable to find out, but the chances are largely in favour of it if it passes through the hands of the Chinese merchants. I obtained two samples of the oil direct from the distiller, and find they are limpid and quite fluid at ordinary temperatures, but at 4° F. they become rather thicker, but remain bright and clear.

The golden-brown oil has a specific gravity of .9580 at 85° F., and the green oil a specific gravity of .9578 at the same temperature.

The spectrum exhibited by the golden-brown oil is not crossed by any absorption bands, and is, therefore, not of much use in detecting admixture of foreign oils. The red, yellow, and green light, as far as the *b* line, is transmitted with full intensity; but the blue-green from *b* to *F* is much absorbed, and beyond the latter line all is complete darkness. The limits of this spectrum in wave lengths are 7140 to 4165 the oil being contained in a tube .6 inch in diameter, both daylight and lamplight being used with the same results.

The green oil gives a spectrum of full intensity from the *c* line to midway between the *b* and *F*. lines, from which point it shades off gradually and disappears a little before the *h* line is reached. At the red end it extends beyond the *c* line, but with reduced intensity as far as to between the *A* and *a* lines. In wave lengths the limits of this spectrum are 7390 to 4130 in daylight. Lamplight gives a greater extension towards the red end, but much less in the violet.

I have seen oil that has been kept for 10 years in a bottle with a loose stopper, which had become of a dark-brown colour and of a syrupy consistency, but it seems probable that it would not undergo this change if kept in a tight stoppered or corked bottle. The scent of this old oil, however, was little inferior to fresh, though not quite so powerful. This bears out the statement in Ure's *Dictionary of Arts*, that "the essential oil of patchouli is one of the least volatile of any known, hence it is one of the most persistent of perfumes from plants."

In the same work it is stated that if the plant be distilled, after it has been gathered several years, more than half the product will assume a crystallisable form far less fragrant than the newer fluid essential oil, and would probably be quite odourless if repeatedly crystallised from alcohol. The crystals of patchouli are rhombic with pyramidal summits; chemically they resemble camphor in composition. When the fluid essential oil of patchouli is submitted to fractional distillation, there comes at the highest temperature a peculiar blue body, termed by

Piesse *Azulene*, "resembling the blue in the essential oil of wild " camomile ; it requires, however, further examination."

"Ill effects, such as loss of appetite and sleep, nervous attacks, &c., " have been ascribed to the excessive employment of patchouli as a " perfume." (*Lindley's Treasury of Botany*.) But as one of its great uses is to mix with the stuffing of beds and pillows, under the idea that it is inimical to vermin, this can scarcely be the case. This same property of keeping off insects caused it to be used to pack with Indian shawls and so led to its introduction into Europe.

In connexion with this it should be mentioned that I have distilled a quantity of the *Ruku* leaves (one of the plants used to mix with patchouli), and have obtained a very dark green viscous oil, smelling strongly of the plant.

The amount of oil is not great, and it is unlikely to have any value of its own, for the scent of it is not altogether pleasant.

MARKET.

Mr. N. Cantley, Superintendent of the Botanical Gardens, Singapore, in a paper entitled, "Notes on Economic Plants" in the *Journal* of the Straits Branch of the Royal Asiatic Society, says, "Plants of patchouli " have been in demand for experimental planting, and a good number " have been supplied. Picked leaves are now selling at \$17 per pikul. " The plants grow freely with but little care, and should figure among " colonial products." This statement, although correct as far as it goes, gives a mistaken idea of the circumstances of the case. The production now is quite equal to the demand, which seems to be very limited, consequently the market is soon glutted, particularly with the oil. A Penang merchant writes me that "the demand is very slack at present " owing to an over-production of the leaf, stimulated by the high prices " paid about a year and a half ago. The article (the leaf) is used very " largely in Calcutta and Bombay, principally in the latter place." The same slackness is felt in the sale of the oil, the market for which, by-the-bye, is London. Another merchant informed me that the last lot of oil he had shipped to England had not found buyers at prices which would pay him to sell.

Unless therefore the use of the leaves and oil could be very materially increased, there seems to be no prospect of profitably cultivating it on a large scale.

CII.—P'U-ÊRH TEA.

In the *Kew Bulletin* for last month (1889, p. 118) an account was given of P'u-êrh tea which appears in commerce from the province of Yün-nan in the south-west of China. At the time this account was written Kew had not received from the Foreign Office the very important *Report of a Journey in South-Western China* by Mr. F. S. A. Bourne, Her Majesty's Consular Agent at Ch'ung Kiang.—China, No. 1 (1888), presented to Parliament last June. Attention to this report was drawn in the *Daily News* by a writer who had evidently made himself thoroughly acquainted with the subject. The information supplied by Mr. Bourne respecting P'u-êrh tea confirms in every respect the account already given in the *Kew Bulletin*, but he was able to gather locally numerous interesting facts respecting the manufacture and selection of the tea which are given in the following extracts:—

The tea hills are situated six to ten days south-west of Ssü-mao and about the same distance north-west of the Me-khong on both sides of a left bank affluent of that river. It is six days' journey from Ssü-mao to I-bang, the chief of the tea-hills. The road was said to cross two steep hills during the first day and two steep hills during the second day; the third day the road is downhill for the most part to Mêng-wang T'u-ssü which is very malarious; on the fourth day there is a further descent to the Man-nao river; on the fifth day the road is up and down hill for the whole distance; and on the sixth day there is a steady ascent to I-bang. From I-bang to Yu-lê is three days' journey, and to I-wu two days'. From Man-nao to Chêng-tung is two days', and from Chêng-tung to Mo-hei three days' journey. A day's journey may be taken as 18 to 22 miles. Yu-lê formerly belonged to the I-bang district, but became the property of a Yao chief who gave it with his daughter when she married a former Hsüan-wei Ssü whose private property the hill now is.

* * * * *

On the 2nd January 1886 the magistrate was kind enough to take me to see some tea trees at a place called Lu-ying, three-quarters of a mile to the north-west of the city, where he had a big arbour erected of bamboos covered with fir branches to sit and talk in. There were only five trees, of which one stood about 12 feet high, consisting of seven stems, the biggest of about 4 inches diameter; this tree was said to be very old. The magistrate told me that these trees were the remnant of an extensive plantation that was cut down and burnt during the Mahomedan rebellion, and that they were of exactly the same species as that from which P'u-êrh tea is made. Whether this is so, or whether these are merely wild tea trees, which are found here and there all over Southern China, it is impossible to say. According to popular tradition, tea was introduced into this part by the great K'ung-ming when he conquered the south.

* * * * *

At all events, it does not seem likely that shrubs on the Ssü-mao plain ever gave good tea, or the leaf would not be brought here from 6 to 14 days' journey south, over bad roads; and, further, it is only within the last eight or nine years that the leaf has been brought out and made up at Ssü-mao at all.

It would be necessary to visit the tea-hills to give a satisfactory account of the trade; meantime the following notes, the result of many inquiries, may be useful. Neglecting the official account,* which does not square with present facts, we must begin with the distinction between tea grown on the hills, I-bang, I-wu, Mansa, and the neighbouring heights, called "yen ch'a" (strong tea), and that which grows on the lower slopes and in the valley of the Me-khong and its tributaries, called "san ch'a" or "yeh ch'a" (wild tea).

The finest tea, made of the young spring leaves from shrubs on the hills, is called "ya ch'a" or "mao-chien." This is only made at the hills, and I could not obtain a specimen. Some of this good leaf was

* Notes from the "Topography:" the six tea-hills are Yu-lê, Kê-têng, I-bang, Mang-chih, Man-chuan, and Mansa (another extract substitutes Chia-pu, Hsi-k'ung, and I-wu for Yu-lê, Mang-chih, and Mansa). The hills occupy an area with a circuit of 800 li. There is a tree called the tea-king, singular as being much bigger than any other tree at the hills. It was planted by K'ung-ming; even to the present day the aborigines worship it. The flavour of the tea varies with varying soils; it is best grown on red earth or amongst stones of different kinds; it then helps digestion, dissipates fever, and acts as an antidote.

said to go to Yünnan Fu, and there to be made up into balls as big as a man's head, for the Court at Peking. The next quality is called "pai chien" or "hsi ch'a," and is sent in small quantities to many parts of the empire, where very high prices are paid for it.

The tea made up at Ssü-mao is for the most part of the second description, *i.e.*, "san ch'a." During the season, which extends from March to September, the leaf from the lower levels is picked, rolled, dried, and sent to Ssü-mao, packed on the backs of oxen; there it is sorted out into heaps according to quality. The manufacture of the leaf into the familiar cake of P'u-êrh tea, well known all over West China, goes on all the year round. I saw the process, which is very simple, in the go-down of a firm trading under the name of "New Spring Thunder." A large round iron boiler, of the well known Chinese pattern, is covered by a wooden barrel, held in position by a heavy stone, so that a vigorous jet of steam issues from a single vent at the top. Nine Chinese ounces of tea are weighed out and sprinkled into a copper vessel perforated below, which is then placed over the vent so that the tea is permeated by steam. After about a minute the vessel is removed and the tea poured into a cotton bag, the ends of which are wound round and squeezed into a lump in the middle of the cake. The bag is then placed beneath a heavy stone, on which a man stands, and pressed into a quoit-like shape, the ends of the bag making the indentation in the centre. The cake is then placed in a rack to cool. When cold the bag is removed, and the cake is in the condition of the P'u-êrh tea of commerce. The same process is said to be followed at the hills.

In the case of the particular tea of which I watched the manufacture, the finer sort of Ssü-mao tea, that goes to Ssü-ch'uan, four descriptions of leaf were used—the 9 oz., consisting of $\frac{1}{2}$ oz. fire young leaves and $1\frac{1}{2}$ oz., 3 ozs., and 4 ozs. of three other qualities coarse in proportion to their weight; and the whole art of the process appeared to consist in a judicious arrangement, by which the white delicate leaves were made to take up a conspicuous position on the outside of the cake, while the coarsest sort was carefully billeted in the centre. No. 1 was "pai-chien;" Nos. 2 and 3 were from the smaller hills in the neighbourhood of I-bang and I-wu, called "so-pien" (what is at the side); and No. 4 came from the plain of Me-khong, and was probably wild tea, from which the coarsest leaves had been sorted.

It will surprise no one acquainted with China that the rule that the best tea is to be made up at the hills is very badly observed. What rule is not? In fact, the merchant Thunder, managing partner of the New Spring Thunder House, told me that No. 1 was from I-wu. The truth is that the making up in a cake so favours blending that no tea seems to come from one place or to be of one quality. The only way to get an idea of the trade is to make very broad distinctions. Taken in this way P'u-êrh tea may be divided into five classes, *viz.* :—

1. The finest tea, called "mao-chien," "ya ch'a," &c. This is made in small quantities at the hills, and I could get neither reliable particulars as to price nor specimens.

2. Tea of good quality called "hsi ch'a," &c., of which there is a large export to other provinces through Yünnan Fu, especially to Ssü-ch'uan. The tea of which I watched the manufacture, as described above, was an inferior tea of this class (specimen sent to India).

3. "Ping lao," this is "so-pien" tea, just as it is picked without being sorted. Sent to I-hsi or Western Yünnan (Ta-li Fu, Yung-ch'ang Fu, &c.) (specimen sent to India).

4. Inferior tea, made chiefly at Ssü-mao, and consumed in the province of Yünnan.

5. "Chin-t'uan," made in balls for the Ku-tsung and Thibetan market. This is made of the coarsest yellow leaves picked out from other varieties, with a shallow coating of "so-pien" on the outside of the ball (specimen sent to India).

The four first descriptions are packed in a "t'ung," or packet, of seven cakes, which therefore weighs 63 ozs., or with the covering of bamboo bark 4 catties. Twelve such packets are placed in a bamboo case, which forms one side of a horse's load, the load being thus 96 catties. The seven balls of class No. 5 are packed in a roll, which is supposed to be of the same weight as a packet, but the Thibetans are regularly squeezed some ounces on each roll.

Prices at Ssü-mao, duty paid, are said to have averaged during 1885 as follows:—

No. 2, "hsi ch'a," 14 taels per 100 catties; No. 3, "ping-lao," 12 taels per 100 catties; No. 5, "chin-t'uan," 9 taels per 100 catties. Carriage from Ssü-mao to Yünnan Fu ranges between 3 taels and 3 t. 5 m. per 100 catties. Duty at Ssü-mao is 7 mace, and *li-kin* 1 tael to 1 t. 2 m. per 100 catties according to quality.

The estimates of the amount of tea turned out during the year varied from 12,000 to 24,000 [?] loads. There are two roads by which the tea comes, one from I-bang through Ssü-mao, and the other from I-wu through Mêng-nai to Mo-hei. There are *li-kin* stations both at Ssü-mao and Mêng-nai. The most reliable estimate was given me by the *li-kin* collector at Ssü-mao, who said that Ssü-mao sent 3,000 to 4,000 loads in the year, and the hills about 12,000, making in all a production of about 15,000 loads, about half of Nos. 2 and 4, and half of Nos. 3 and 5. Taking 12 taels as the average price per load, the gross value of the trade here during 1885 would have been about 180,000 taels, or 45,000*l*.

The supply was said to depend on the demand from Yün-nan Fu, which seems to be the *entrepôt* of the trade. The production had been much greater in 1884. The trade had suffered greatly from the rebellion, when the trees were cut down and burnt, and the people who used to buy the tea were killed. The demand from Ssü-ch'uan had increased and had partly made up, but prices had recently been very bad in consequence of the high price of food in that province, which left the people little to spend on good tea.

CIII.—AGRICULTURAL INDUSTRIES AT THE GAMBIA.

The British Settlement on the Gambia according to the *Colonial Office List* consists of the Island of St. Mary, British Combo, Albreda, the Ceded Mile, and McCarthy's Island, situated between the falls of Barraconda and Bathurst. This island forms the line of demarcation between those portions of the river known as the *upper* and *lower* river, the whole of the latter being British waters. The total area of the settlement is about 69 square miles. The principal productions of the settlement and of the adjoining districts are ground nuts, hides, beeswax, rice, cotton, maize, guinea corn, palm kernels, india-rubber, cola nuts, and native "pagns" or country cloths. With the exception of the weaving of cotton into native cloths called pagns, the manufacture of vegetable oils, boat-building, and some brick-making, there are no manufacturing industries in the country. The ground nut is the staple

product of the settlement. This is exported to the South of Europe for the extraction of oil. Owing, however, to the competition of mineral oils, the demand for ground nut oil has declined, and at the present time the sole industry in the Gambia is threatened with extinction. Under these circumstances steps are sought to be taken to promote new industries and revive interest in others which flourished before ground nuts claimed chief attention.

The present Administrator of the Gambia, Mr. Gilbert T. Carter, has taken a deep personal interest in the subject, and at the request of the Secretary of State for the Colonies, suggestions have been offered from Kew with the view of supporting Mr. Carter's efforts. The exact circumstances are very fully dealt with in the following papers:—

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR,

Downing Street, 2nd January 1889.

I AM directed by the Secretary of State for the Colonies to transmit for your information copies of correspondence with the Governor of the Gambia relating to expenditure on agricultural experiments.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

The Director, Royal Gardens, Kew.

ACTING ADMINISTRATOR CARTER to LORD KNUTSFORD.

Government House, Bathurst,

MY LORD,

2nd October 1888.

I HAVE the honour to report that I have been endeavouring to turn to profitable use some of the large available space in the Government House grounds at Bathurst. Hitherto it may be said that no attempt has been made to utilise or even render attractive the so-called garden attached to the house; though it must be admitted that unless the Administrator was prepared to spend his own time and money over this desirable improvement, it would be impossible to alter to any appreciable extent the unsatisfactory condition of things which appears to have been recognised as inevitable by successive Administrators of the Government.

2. There are $3\frac{3}{4}$ acres of ground in connexion with the house, and the rule has been to provide in the annual estimates for *two* labourers who were supposed to be equal to the task of keeping this space in order; these two men for many years have been army pensioners with the proverbial faculty for continuing their existence which is characteristic of annuitants. One, however, was dismissed some time ago for misconduct, and the other still remains and does the best his years will permit. I have been unable to discover this man's age, but have ascertained that he received his discharge in 1863 as being "worn out by long service." The other pensioner has of course been replaced by a younger man.

3. I have been determined, however, to make an effort to improve matters, and accordingly I devoted my horse allowance to the employment of four men who could act as hammock-men as well as labourers, and with the assistance of convict labour commenced to clear a large space which had always been a wilderness of rank grass, and a refuge for snakes and other noxious reptiles. A small alligator was found there on one occasion, and as the space in question was separated from the house only by about 40 yards, unpleasant reflections were apt to obtrude themselves upon one's imagination, more especially during the dyspeptic periods, which are not uncommon during the rainy season in Bathurst.

4. As I found even the additional four men insufficient, and moreover was out of pocket by the arrangement, as the men could not be got for less than 17. per month, and expect rations when they are employed away from Bathurst, I engaged two more men, and drew the available horse allowance of the superintendent of police whose duties the Administrator is at present performing, and with these six men, in addition to a small gang of convicts, I have succeeded in reducing the grounds to something like order, but vegetation grows so rapidly in this country that the men have to be constantly employed even to keep the place clear.

5. I hope in time to render this space both ornamental and productive. I have planted a number of cocoa-nuts, bananas, and plantains, and intend to experiment upon other economic trees and plants. I find that amongst some plants sent out to Administrator Moloney from Kew there is a valuable rubber-producing tree, the Ceara Rubber (*Manihot Glaziovii*).

6. As this tree evidently thrives vigorously in the soil of the Gambia, its introduction here cannot fail to be of immense advantage to the settlement. I have transplanted several young trees in the space now made available for experiments of this nature, and have no doubt, with the personal care which I shall be able to devote to them, that they will be successfully established.

7. Your Lordship cannot fail to realise the importance of the extension of economic botany in a place like this, which is practically dependent upon one staple, and I feel sure that I may count upon generous assistance from the Colonial Office in my endeavours to introduce new or extended industrial sources.

8. One grave drawback at Government House is the want of good water in the dry season; there are four wells, but the water in all of them is brackish. At the Military Hospital a short distance off there is good water, and much time and labour is wasted by the necessity of conveying water for irrigating purposes from one place to the other. It is my intention to go on digging in various places at Government House until I find good water, for it is a curious circumstance in this place that a brackish well and one with sweet water may be found within a few yards of each other.

9. It is my intention to ask your Lordship to allow me to place the sum of 300*l.* in the Estimates for 1889 to enable me to carry on my experiments. This sum to be devoted to labour, the digging of wells, and if necessary procuring large tanks for the storage of rain-water. I propose also if practicable to get a gardener from Madeira who will be able to superintend the work under my directions and see that the men do not idle. During the present rainy season I have had to do a great deal myself, with the result that for some weeks I was far from well, though fortunately not incapacitated from work—the season, however, has been an unhealthy one, and there has been a good deal of fever about, from which the Natives have not been exempt.

I have, &c.

(Signed) G. T. CARTER,

Acting Administrator.

The Right Hon. Lord Knutsford, G.C.M.G.,
&c. &c. &c.

LORD KNUTSFORD to ACTING ADMINISTRATOR CARTER.

SIR,

Downing Street, November 15, 1888.

I HAVE the honour to acknowledge the receipt of your despatch, separate, of 2nd ultimo, reporting what you had done with a view to turning to profitable use the grounds of the Government House at

Bathurst, and asking permission to place on the Estimates for 1889 a sum of 300*l.* to enable you to continue your experiments.

Under the circumstances I will not withhold my authority for the insertion of the amount in question in the Estimates, but it must be distinctly understood that its sanction will depend upon your being able clearly to show that the income of the Colony will properly bear the charge; and if, during the year, the revenue shows any signs of diminution the expenditure on this service must be at once stopped.

I have to convey to you my sanction of what you have already done in the matter, and of your employment for the purpose of the available horse allowance of the Superintendent of Police.

I have, &c.

(Signed) KNUTSFORD.

The Acting Administrator of the Gambia.

ADMINISTRATOR CARTER to LORD KNUTSFORD.

Government House, Bathurst,

December 3, 1888.

MR LORD,

I HAVE the honour to acknowledge the receipt of your Lordship's despatch "Separate," of the 15th ultimo, conveying assent to my proposal to place the sum of 300*l.* in the Estimates for 1889 in order that agricultural experiments might be made in the grounds of Government House, which it is hoped may ultimately prove beneficial to the settlement, provided I am able to show that the income for the coming year will properly bear the charge.

2. I beg to thank your Lordship for this concession, and shall hope to be in a position to include the sum specified, which I am sure will bear the approbation of the Legislative Council.

3. I have already demonstrated that the Ceara Rubber tree thrives remarkably well, and grows with great rapidity, and I hope during the next rains to be in a position to distribute some young trees in Combo, and in the Ceded Mile.

4. Your Lordship may be sure that in the event of the revenue showing any signs of diminution I shall at once cease to draw upon the vote, but I have every expectation that there will be a marked improvement in the trade of the Gambia during next year, which I trust may be sustained in future ones.

I have, &c.

(Signed) G. T. CARTER,

The Right Hon. the Secretary of State
for the Colonies, &c. &c. &c.

Administrator.

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

SIR,

Royal Gardens, Kew, January 17th, 1889.

I HAVE the honour to acknowledge the receipt of your letter of January 2, transmitting copies of correspondence with the Administrator of the Gambia on agricultural experiments.

2. It appears to me that Mr. Carter's efforts to introduce the cultivation of new staples into the Gambia are extremely creditable to him, and deserve every encouragement.

3. I find, from the records here, that as far back as 1863, Governor D'Arcy pointed out to the Duke of Newcastle "how very varied and numerous" were the articles exported from Senegal as compared with

those from the Gambia. Sir William Hooker appears at that time to have urged the introduction of "economical and commercial plants."

4. The staple product of the settlement, however, still remains the ground nut, and I understand that the financial equilibrium of the Gambia is practically dependent on the success of the crop. This appears to me a very precarious position. Till, however, Captain Moloney became Administrator in 1884, I cannot discover that any determined attempt had been made to introduce any other plant which would add to the resources of the settlement.

5. A large collection of ornamental and economic plants were sent out from Kew in 1884 to Administrator Moloney, and amongst these the Ceara rubber tree, *Manihott Glaziovii*, appears to have become established. If the extraction of rubber from this tree were found practicable by the natives, and its cultivation were extended, a valuable new industry would spring up.

6. In 1886 a sample of Yoruba indigo was forwarded to Kew for report by the Colonial Office on the part of the Honourable J. D. Richards, Member of the Legislative Council of the Gambia. This is a kind of indigo peculiar to the West Coast of Africa and inferior in value to ordinary commercial indigo. It does not appear at present to be known in commerce. But it is quite possible that if the mode of preparation could be improved it might find a market and so give rise to an established industry. (See *Kew Bulletin* 1888, pp. 268, 269).

7. In the same year, at the request of Administrator Carter, a case of Vanilla plants was procured and despatched to the Gambia. From a subsequent report it appears that they reached their destination in excellent condition and promise to do well.

8. It is quite evident that the success which has been obtained in these two cases might be indefinitely extended. Everything however depends on having men on the spot, like Administrators Moloney and Carter, who will take a personal interest in the experiments. The ground about Government House which Administrator Carter has cleared appears excellently suited for the purpose if only a supply of water which is not brackish could be secured. Certainly it is most praiseworthy to have declined to follow the example of his predecessors in regarding "as inevitable" the occupation of this ground by rank grass, snakes, and alligators.

9. As you are aware a botanical station has been established at Lagos and is now in working order. This has been stocked with a large variety of seeds from Kew or sent through this establishment from other tropical colonies. Administrator Carter might perhaps draw on the resources of the Lagos Botanical Station both for plants and seeds as well as for information as to the practical results derived from the experimental cultivation of various introduced plants. In the meantime it appears to me that an attempt might be made to establish at the Gambia the cultivation of both Liberian coffee and of the cocoa-nut. Neither of these important plants are, as far as I am aware, cultivated in the Settlement.

10. The despatch of the Secretary of State does not perhaps view the Administrator's attempt in a very sanguine spirit. I do not for my part see why some measure of success in work of this kind should be despaired of at the Gambia. The history of this settlement is no doubt depressing. But as far as I can ascertain no one before Administrators Carter and Moloney has ever attempted to face the problem, and it appears to me that work of this kind deserves every support. The achievement of results no doubt demands patience. But the example of

Sir John Kirk at Zanzibar shows that persistent effort in this direction is not without its reward even in a comparatively brief space of time.

I am, &c.

(Signed) W. T. THISELTON DYER.

Sir R. W. Herbert, K.C.B.

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR, Downing Street, 26th January 1889.

I AM directed by the Secretary of State for the Colonies to thank you for your letter of the 17th instant on the subject of the agricultural experiments which are being made by the Administrator of the Gambia, and to transmit to you a copy of the despatch with which our letter has been sent to Mr. Carter.

I am, &c.

(Signed) ROBERT G. W. HERBERT.

The Director, Royal Gardens, Kew.

LORD KNUTSFORD to ADMINISTRATOR CARTER.

SIR, Downing Street, 25th January 1889.

WITH reference to your despatch, separate, of 3rd ultimo, I have the honour to transmit to you a copy of a letter from the Director of the Royal Gardens at Kew on the subject of the agricultural experiments which you are making at the Gambia.

I would suggest that you should communicate with Governor Moloney with the view of obtaining plants, seeds, and information from the Lagos Botanical Station, as recommended by Mr. Thiselton Dyer.

I fully approve of your efforts to develop the resources of the settlement and introduce fresh articles for cultivation, and I shall look with interest to see the result of your experiments.

I have, &c.

Administrator Carter.

(Signed) KNUTSFORD.

COLONIAL OFFICE to ROYAL GARDENS, KEW.

Downing Street, April 6, 1889.

THE Under Secretary of State for the Colonies presents his compliments to the Director of the Royal Gardens, Kew, and begs to enclose for his information a copy of a despatch from the Governor of the Gambia on the subject of certain agricultural experiments.

[Enclosure.]

ADMINISTRATOR CARTER to LORD KNUTSFORD.

Government House, Bathurst,

MY LORD,

March 1, 1889.

I HAVE the honour to acknowledge your Lordship's despatch No. 7, of the 25th January, enclosing a copy of a letter from the Director of Kew Gardens, having reference to the agricultural experiments which I am conducting in the grounds at Government House in the Colony.

2. I am very gratified to receive your Lordship's approval of my efforts in this direction and likewise the encouraging remarks of Mr. Thiselton Dyer, which I trust will stimulate others besides myself to give greater attention to this most important subject.

3. It has always seemed to me that the question of agriculture is the one of all others to which an Administrator of the Gambia should principally devote himself, if the material prospects of the country are to be advanced beyond the narrow line which has hitherto been deemed sufficient by those responsible for the government of the old settlement. Successive Administrators have deplored the restriction to one staple, but it has not yet been found possible to supplant the solitary product upon which the Gambia has been practically dependent for so long, or to add to the list of exports, which to any appreciable extent would influence the revenue of the Colony.

4. The severe lesson which we have lately received ought at any rate to impress upon us the gravity of the situation, and it was with a full consciousness of the necessity for a move to be made in the direction indicated, that I suggested the addition of a sum of 300*l.* to the estimates for 1889 in order that a start might be made to show whether the future of the Colony is or is not to be bound up in the inevitable ground-nut.

5. It is certain that nothing can be done without the initiative of the Government. At the present moment there is no mercantile establishment in the Colony in a position to sink capital in such a venture, and under any circumstances to secure a measure of financial success it would be necessary to undertake any planting operations, which might be decided upon, at some distance from Bathurst, where the protective capacity of the Government would be of a very limited character. There are, I admit, many serious difficulties in the way of developing the agricultural resources of the Gambia, but it is clear that nothing can be gained by the absence of any effort to overcome them. The great and principal drawback is the want of good water. I know of no well in Bathurst which gives a supply which is not more or less brackish, thus very seriously militating against the growth of many plants on the island itself. On the mainland of Barra and Combo the same difficulty exists, but there are certain spots where a permanent supply of good fresh water is to be obtained, and if the Colony were in a position to establish a Botanical Garden in one of those localities, and to maintain it on a proper scale, I am quite sure that much good would result. It would, however, be necessary to secure the services of a thoroughly competent manager, who should be a trained botanist, with a proper staff of labourers. There can be no doubt that any money spent in this direction would be well laid out. Another difficulty arises from the comparatively small rainfall of this district, whereas only 500 miles to the southward there is a rainfall of sometimes over 200 inches, in the Gambia it rarely exceeds 50 inches, and there is practically eight months drought. As may be readily understood, such climatic conditions are very trying to many vegetable products otherwise suited to tropical life. Nevertheless, there are many valuable plants which thrive even under such circumstances, and the problem is to find and utilise them. I am very sanguine that one of these plants has been found in the Ceara rubber tree (*Manihot Glaziovii*). All the seedlings which I have raised are growing vigorously, and I have carefully collected all the seeds procurable from last year's bearing, and intend to distribute them in favourable localities for planting during the next rainy season; as the plants grow equally readily from slips, I shall also raise trees where practicable by these means.

6. The whole of the Government House grounds have now been cleared, and many of the cocoa-nuts which I planted in August last have commenced to shoot. I am economising the 300*l.* as much as

possible during the dry season, as there is not much to be done except watering and keeping down the weeds, which spring up even with the present absence of moisture, but a good staff of men will have to be kept on during the rainy season to prevent the grounds from falling back into their original condition. I shall endeavour to secure the services of a practical gardener from Madeira or the Canary Islands from July to the end of the year, on the most reasonable terms possible.

7. In regard to the Vanilla plants, they did very well so long as I was able to give them my personal attention, but subsequently they all died off. I do not think however that the Gambia is suitable for this plant. So far as I know they thrive best in countries where there is a more copious rainfall and the soil contains a larger proportion of nutritive properties than is the case here. I fear also that the Liberian coffee would fail from the same cause, though there may be localities in Combo where the shrub might be grown to a limited extent. The principal ingredient in nearly all the soils I have examined, even at some miles in the interior, is sand, and as the ground is never manured in a practical and efficient manner, its productive qualities are naturally much restricted.

8. Since my arrival in Bathurst six and a half years ago I have endeavoured, both by example and precept, to demonstrate to the native mind what can be done by intelligent manipulation of a sterile and unpromising soil. I started a garden in the Military Hospital compound which produced most of the English salads and vegetables in great perfection, and which I am glad to say is still in full vigour. It was a part of my plan to show that an English gentleman was not too proud or too indolent to work with his hands, for in the early morning and evening I prepared most of the beds myself, and trained a man in the proper method of working the system to advantage. Since then most of the Europeans have started gardens, but I regret to say that the native class whose interests I was anxious to advance have not yet learnt the lesson I endeavoured to inculcate. Even now it is not possible to buy a cabbage or lettuce in the market, although almost every householder in Bathurst might cultivate a small plot of ground if he chose to do so. In spite of the brackish water, I have grown strawberries quite equal to the ordinary growths in England, and although the natural soil is the worst imaginable for the successful cultivation of roses, yet with judicious management I possess many vigorous plants which give me a daily supply of their exquisite blossoms. I mention these personal matters not in any spirit of self-glorification, but merely to show that in spite of natural difficulties they may be overcome with patience and effort. It is possible that I may not be here to witness the fruits of my labours, but I trust some future Administrator of the Gambia may be able to look back with satisfaction upon the small fund which was set aside for agricultural experiments in the year 1889.

I have, &c.

(Signed) G. T. CARTER,

The Right Hon. Lord Knutsford, G.C.M.G., Administrator.
&c. &c. &c.

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

SIR,

Royal Gardens, Kew, May 15, 1889.

I AM desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 6th instant, forwarding a copy of a despatch from

the Administrator of the Gambia on the subject of certain agricultural experiments undertaken by him in that settlement.

2. It is evident from this despatch, as indeed from previous papers forwarded from Mr. Carter, that he is fully prepared to grapple with the difficulties incidental to an attempt to give new life and direction to the vegetable products of the Gambia. He appears to be well acquainted with the drawbacks as affecting vegetable life inseparable from a small rainfall and an unpromising soil, and there are therefore reasonable hopes that his efforts will be directed so as to produce results of a permanent and satisfactory character.

3. As preliminary industries Mr. Carter is disposed to regard the cultivation of cocoa-nuts and ceara rubber trees as well suited to the circumstances of the Gambia. Indeed some measure of success has already been attained with these. As regards cocoa-nuts it would be well to follow the systematic efforts made under similar circumstances in the Colony of Lagos by Governor Moloney and establish large nurseries of seed cocoa-nuts from whence plants could be supplied at a cheap rate or free to all persons willing to undertake their cultivation. The exact localities for establishing nurseries can be decided only on the spot. It is important, however, that the nurseries be easily accessible to the people, and if possible under their observation. From what can be gathered on this side Cape St. Mary and similar localities deserve to be specially considered in connexion with the planting of cocoa-nut palms.

4. In a despatch from Governor Moloney to the Colonial Office, dated 12th November 1888, it is stated, "At the end of September the cocoa-nut seed planting of the Government reached 31,483. It is intended to establish permanently in the Eastern and Western Districts, at the beginning of the next rainy season, plantations to the extent of 30,000, the fruit of which in time should be worth 6,000*l.* per annum to the Government; further, to continue in the future the nursery work to keep a supply of seedlings on hand to replace failures, and for distribution among the people in exchange for seed nuts, or by purchase at the low rate of one penny each The Government has recently received an order for 1,000 seedlings for a cocoa-nut plantation contemplated at the south-east end of the Island of Lagos."

5. In the Fifth Report on the Botanical Station at Lagos recently issued it is further mentioned that "1,000 cocoa-nut seedlings have been recently sold during the quarter from the Leckie nurseries," and "5,000 cocoa-nut seedlings are to be supplied in the Western District at the beginning of the next rainy season."

6. To obtain results that will at all affect the welfare of the settlement it is necessary at first to take up two or three of the most suitable and promising cultures and promote them by such energetic and systematic efforts as are above described. A cocoa-nut industry would ameliorate local conditions, as well as give rise eventually to an export trade. In addition to fresh nuts, for which there is a steady demand both in Europe and in the United States, there would eventually arise a demand for oil and copra as also for coir fibre, similar to what was lately sent to this country from Lagos. The best or "bristle" fibre sells at 30*l.* per ton, while "mat" fibre sells at about 10*l.* per ton.

7. If the cocoa-nut palm thrives at all at the Gambia and yields only moderate crops it is evident that no plant can be more suitable for general permanent cultivation. Its natural home is on sandy sea-shores exposed to the full influence of the sea, and if there is water in the sub-soil it can bear certain periods of drought with impunity.

8. It is gratifying to find that the Ceara rubber plants (*Manihot Glaziovii*) sent from Kew in 1884 have found a congenial home at the Gambia. The climate of their natural habitat is described as "very arid for a considerable part of the year." Hence they would appear to be well suited to the circumstances described by Mr. Carter. It is well, however, to remember that the Ceara rubber trees will not repay such regular cultural attention as may be given to cocoa-nut palms. It would be prudent in the first instance to establish the trees as economically as possible by "dibbling" germinated seeds over a large extent of country and treat the plants on the principles of forestry rather than those of pure agriculture. The yield of rubber per tree is small, and hence it would require several thousands to afford anything like an appreciable quantity of rubber. If any difficulty is experienced in obtaining supplies of seed this establishment might possibly be able to arrange to procure them from Ceylon or India. Information respecting the tapping of the trees for rubber could also be furnished later.

9. It is evident, however, that to make an immediate impression upon the prosperity of the Gambia it is necessary to take up other cultures than cocoa-nuts and Ceara rubber. Amongst the plants yielding an immediate return it might be desirable to revive on a large scale the cultivation of maize or Indian corn. At one time it is understood this was grown at the Gambia, before the cultivation of the ground-nut became the dominant culture, and it was said to be exported to the Canary and Cape Verde Islands.

10. The suggestion is thrown out for what it is worth, but Mr. Carter might make inquiries through the Consuls and others whether there is still a market in these islands for Indian corn. If there is, it would require little effort on his part to persuade the people to take up the cultivation. Maize, it must be remembered, is an article in general demand in most temperate countries, and, depending upon the cost of production, it might be found advantageous to export it also to this country or the continent.

11. It has been found necessary in small and comparatively isolated communities like the Gambia to prepare the way and procure information respecting suitable markets before recommending the general cultivation of certain plants. The soil that suits the ground-nut is likely also to suit Indian corn, and the treatment of the plants is very similar. So that, if the prospects of suitable markets are encouraging, the Government might introduce good strains of seed from other countries, and distribute such seed in localities suitable for its culture.

12. Very good specimens of cotton have been received from West Africa, and from the character of native cotton goods prepared inland it is evident that much could be done to extend the cultivation of good varieties of the cotton plant. Where labour is cheap the cultivation of the cotton plant possesses numerous advantages, and especially where the industry is already more or less familiar to the people. Coffee is also grown to some extent inland, and this again might be encouraged by friendly intercourse with the chiefs and the adoption of a consistent policy of encouragement to all agricultural pursuits.

13. Mr. Carter might be glad to peruse the interesting correspondence which has recently taken place respecting the cultivation of fibre plants at the Bahamas. Some portion of this appears in the *Kew Bulletin* for the month of March last. The conditions of climate and soil at the Bahamas and the Gambia are very similar. A semi-rude culture of the character required by species of *Agave* and *Furcraea* may be found suitable to some parts of West Africa, and for the produce there is a steady and almost unlimited demand both here and in the United States.

14. It is not intended here to do more, however, than indicate a few industries which might be experimentally tried at the Gambia. It is well known that efforts of the kind now put forth by Mr. Carter are so entirely dependent on the individuality of the Administrator that it is almost inevitable that they should be of a spasmodic character. It is no wonder, therefore, that the ground gained at one time is more or less lost at another. It would appear, however, that at this settlement at the present time some serious, but not necessarily elaborate, attempt should be made to promote new industries on permanent lines. If a small grant were voted yearly, and it were decided as a regular function of the Government to promote native agricultural industries, the results that would eventually accrue would undoubtedly favourably affect the general prosperity of the settlement.

15. At present Mr. Carter deserves every encouragement in his work, and whether by his own personal efforts or by means of the agency of a botanic station, worked on the same lines as that established at Lagos under Governor Moloney, a start is made in the restoration of industrial prosperity at the Gambia, Mr. Thiselton Dyer will be happy, as far as Kew is concerned, to extend his warmest sympathy and support to all such efforts.

I am, &c.

(Signed) D. MORRIS.

Sir Robert G. W. Herbert, K.C.B.